

Revision of the Genus *Pandanus* Stickman, Part 31
Bornean Species Collected by J. Motley

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EARLY COLLECTORS in Borneo discovered species of *Pandanus* in the native flora. Such was James Motley, and Martelli has already named *P. Motleyanus* in his honor. The writer has studied at Kew other specimens of his collecting, and has distinguished among them the three following new species.

Pandanus apicalis sp. nov. (sect. *Acrostigma*)
Figs. 276 and 276A

DIAGNOSIS HOLOTYPE: Radices caules foliaque incogniti, pedunculo 8 cm longo 13 mm diametro 3-laterato clavato cum syncarpio solitario, syncarpio 6 cm diametro (licet ovoideo et 6-7 cm longo?), drupis 29-31 mm longis 4-7.5 mm latis 2-3 mm crassis fusiformibus vel oblanceoloideis acute 5-6-angulosis parte $\frac{1}{2}$ supera libera et proxime curvata laevi vel subpunctata exlucida, stylo 3-5 mm longo crassiter subulato proxime curvato osseoso luteo lucido basi late angulosa, stigmatibus 3-5 mm longo lineari brunneo papilloso ad apicem extenso, endocarpio in parte $\frac{1}{4}$ infera obovoideo truncato albo chartaceo tenuissimo, semine 4 mm longo, mesocarpio apicali cavernoso elongato cum fibris longitudinalibus et membranibus albis, mesocarpio basali fibroso et carnosio.

DIAGNOSIS OF HOLOTYPE: Vegetative parts unknown; peduncle 8 cm long, 13 mm in diameter, 3-sided, clavate, bearing a single syncarp, this 6 cm in diameter (apparently ovoid and 6-7 cm long?); drupes 29-31 mm long, 4-7.5 mm wide, 2-3 mm thick, fusiform to oblanceoloid, sharply 5-6-angled, upper $\frac{1}{2}$ free and proximally inclined, smooth or slightly punctate, dull; style 3-5 mm long, thick subulate, proximally curved, bony, yellowish, shining, the base broadly angled; stigma 3-5 mm long, linear, brown, papillose, extending to the apex; endocarp in lower $\frac{1}{4}$, obovoid, truncate, white, papery, very thin; seed 4 mm long; apical mesocarp an elongate cavern with longitudinal fibers and white membranes; basal mesocarp fibrous and fleshy.

EXPANDED DESCRIPTION: Plant acaulescent; leaves 2-3 m long, at about the middle 37 mm wide, near the base 28 mm wide, coriaceous, V-sulcate and sharply 2-pleated, dark shiny green above, pale somewhat shiny green below, near the midsection with 34 parallel secondary veins in each half, the tertiary cross veins seen below toward the tip, forming short rhombic meshes; blade ligulate, tapering into the 8 cm trigonous subulate apex, this at the point 10 cm down 7 mm wide, the base apparently pale and unarmed, beginning more than 5 cm from the base the margins with prickles 1.5-2.3 mm long, 6-14 mm apart, oblique deltoid, compressed, ascending, stramineous; the midrib below unarmed for more than the first 40 cm; near the midsection the margins with prickles 0.4-0.6 mm long, 8-13 mm apart, broad subulate to subarcuate lanceolate, compressed, strongly ascending, stramineous; the nearby midrib below unarmed; on the subulate apex the margins and midrib below with serrulations 0.2-0.4 mm long, 1-2 mm apart, stramineous; syncarp 9.3 cm long, 7.2 cm in diameter, ovoid; drupes 29-38 mm long, greenish yellow, upper $\frac{1}{2}$ - $\frac{3}{5}$ free; endocarp in lower $\frac{1}{4}$ - $\frac{1}{5}$; endocarp walls 0.1 mm thick, within smooth.

HOLOTYPE: Borneo, grows in damp woods, James Motley XXXVI, 1,247 (K MUS.).

SPECIMENS EXAMINED: Sarawak, Sabal For. Res., Siminjam Dist., Kuching Div., yellow sandy loam, lower Dipterocarp forest, 200 ft alt., *E. F. Brunig* S.9,975 (SAR).

DISCUSSION: *P. apicalis* is a member of the section *Acrostigma*, as is its closest relative, *P. septentrionalis* St. John, of Mount Kinabalu, North Borneo, a species with the drupes 26-28 mm long; pileus 4-6 mm high, pyramidal-hemispheric; style 2-3 mm long; stigma 1-2 mm long; and the endocarp apex convex. *P.*

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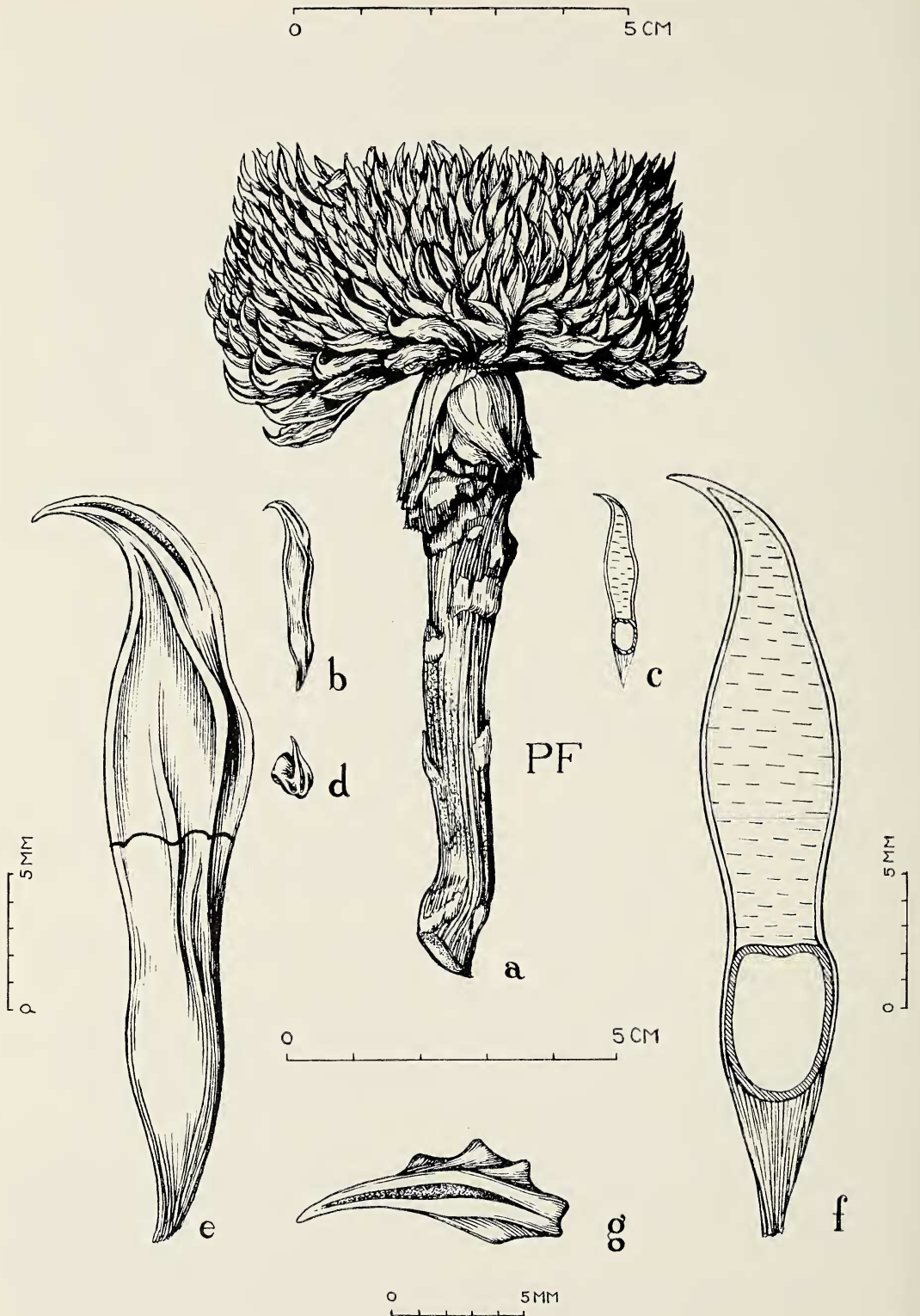


FIG. 276. *Pandanus apicalis* St. John, from holotype. *a*, Peduncle and base of syncarp, $\times 1$; *b*, drupe, lateral view, $\times 1$; *c*, drupe, longitudinal median section, $\times 1$; *d*, drupe, apical view, $\times 1$; *e*, drupe, lateral view, $\times 4$; *f*, drupe, longitudinal median section, $\times 4$; *g*, drupe, style, and stigma, apical view, $\times 4$.

apicalis has the drupes 29–31 mm long; pileus 15 mm high, lanceoloid, sharply 5–6-angled; style 3–5 mm long; stigma 3–5 mm long; and the endocarp apex retuse.

Up to now there is no evidence as to in what part of Borneo Mr. Motley found the specimen. He lived and worked on two sides of the island, and may well have travelled widely while there. He collected several other species of *Pandanus* in Borneo, one of which bears his name. The only other known collection was made by Brunig in the lowland forests near Kuching, Sarawak.

The new epithet is the Latin adjective *apicalis*, apical, and is given with reference to the fact that the stigma extends to the apex of the style.

Pandanus bracteosus sp. nov. (sect.

Microstigma)

Figs. 277 and 277A

DIAGNOSIS HOLOTYPE: Radicibus caulibusque incognitis, folio 1.05 m longo 4 cm lato circa basem

2.8 cm lato coriaceo supra viridi infra pallidiori V-sulcato 2-plicato in sectione mediali cum 40 nervis parallelis secundariis in quoque dimidio nervis tertiis transversis infra evidentis plerumque obliquis et reticulis rhombicis brevioribus quam latioribus formantibus lamina paene ligulata ad $\frac{1}{3}$ ex apice latissima et subito acuta in puncto 10 cm ex apice 36 mm lata basi inermi pallida, ex 2.5 cm marginibus cum aculeis 1–2 mm longis 1–4 mm separatis inferis paucis subulatis-serris sed sequentibus subsigmoideis crassiter subulatis compressis adscendentibus pallidis cum apicibus brunneis, ex 11 cm midnervo infra cum aculeis 3–3.5 mm longis 13–24 mm separatis crassiter arcuatis subulatis valde reflexis stramineis cum apicibus brunneis, in sectione mediali marginibus cum aculeis 2.2–3 mm longis 7–11 mm separatis rectis vel subarcuatis crassiter subulatis valde adscendentibus pallidis cum apicibus brunneis, midnervo infra per tertiam medialem inermi, ad apicem marginibus et midnervo infra cum aculeis 0.6–1.5 mm longis 0.5–2.5 mm separatis arcuatis subulatis valde adscendentibus, pallidis cum apicibus obscure brunneis, ad apicem plicis supra cum aculeis 0.5–1.3 mm longis 2–11 mm separatis arcuatis-subulatis rigidis valde adscendentibus pallidis, inflorescentia foeminea 7 cm longa multi-bracteosa cernua et cum 3 syncarpiis plerumque clausis, pedun-

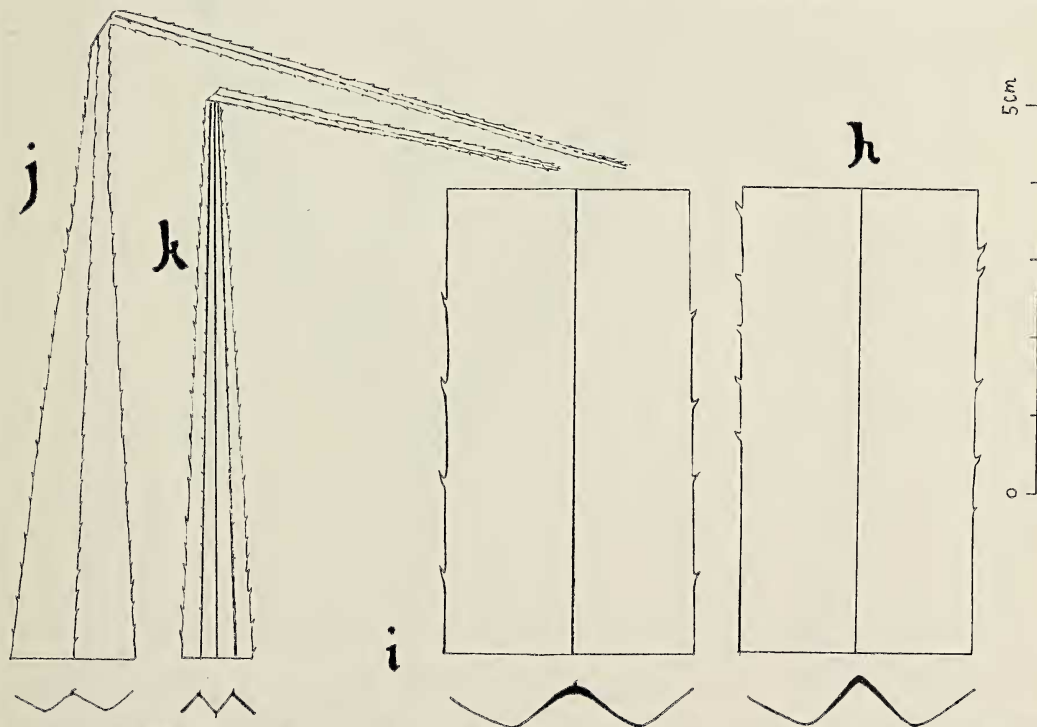


FIG. 276A. *Pandanus apicalis* St. John, from Brunig 9,975. *h*, Leaf base, lower side, $\times 1$; *i*, leaf middle, lower side, $\times 1$; *j*, leaf apex, lower side, $\times 1$; *k*, leaf apex, upper side, $\times 1$.

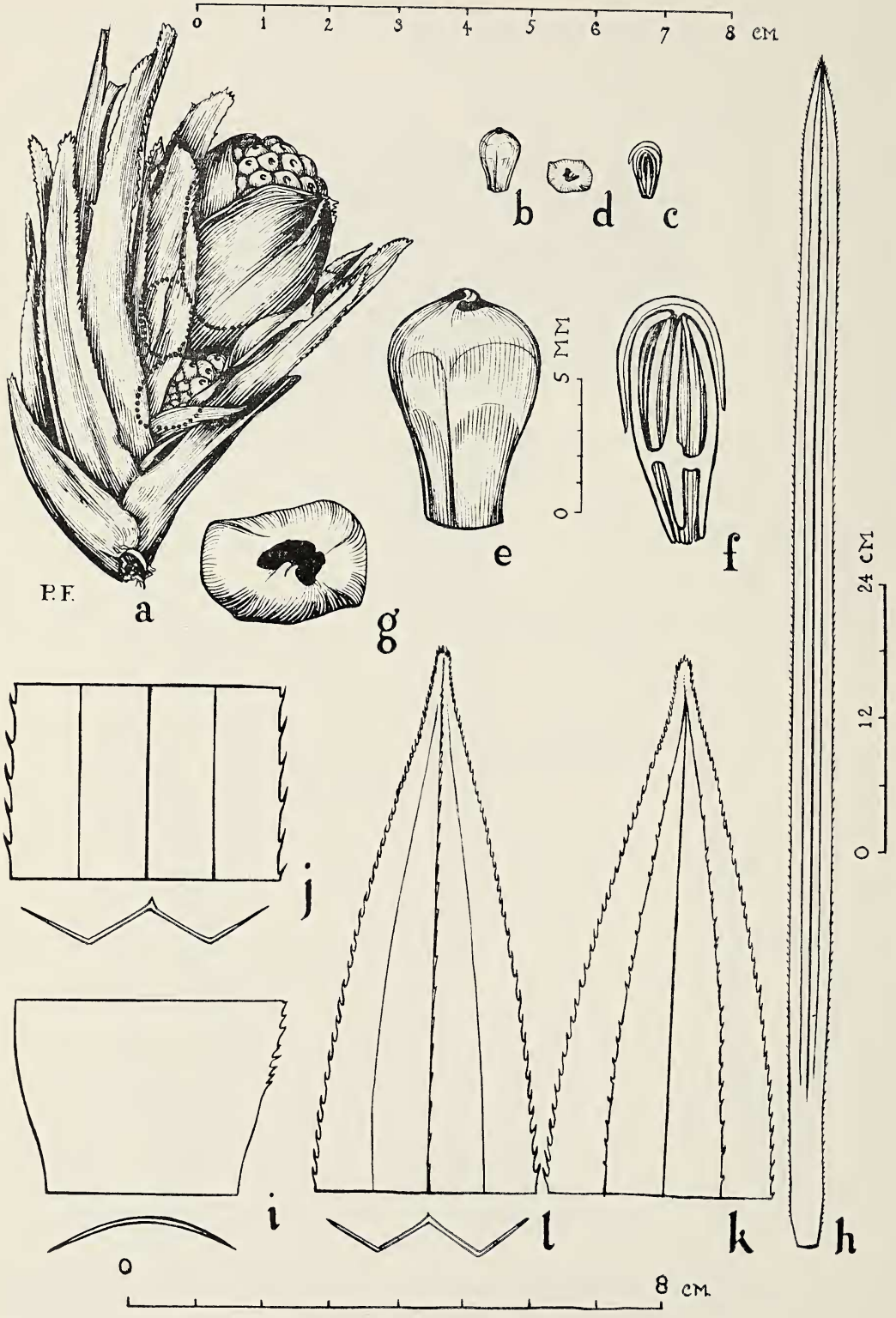


FIG. 277. *Pandanus bracteosus* St. John, from holotype. *a*, Fruiting spike, lateral view, $\times 1$; *b*, drupe, lateral view, $\times 1$; *c*, drupe, longitudinal median section, $\times 1$; *d*, drupe, apical view, $\times 1$; *e*, drupe, lateral view, $\times 4$; *f*, drupe, longitudinal median section, $\times 4$; *g*, drupe and stigma, apical view, $\times 4$; *h*, leaf, $\times \frac{1}{6}$; *i*, leaf base, lower side, $\times 1$; *j*, leaf middle, lower side, $\times 1$; *k*, leaf apex, upper side, $\times 1$; *l*, leaf apex, lower side, $\times 1$.

culo 3 cm longo in toto clauso a bracteis congregatis viridibus, bractea infera 3 cm longa 1.8 cm lata lanceolata cum marginibus superioribus serratis, bractea ultima 6.5 cm longa 2 cm lata oblongo-lanceolata marginibus et midnervo infra in parte $\frac{1}{2}$ ultima subulato-serratis, bracteis syncarpiorum 2.5 cm longis 2.3 cm latis ellipticis concavis, syncarpio apicali 2 cm

diametro globoso, syncarpiis lateralibus 1.3 cm diametro simulantibus, drupis submaturis videtur sed endocarpio et semine non maturato deinde immaturis, drupis inaequalibus eis apicalibus paene duplo latioribus et crassioribus quam illis medialibus et lateralibus inferioribus, drupis 6.5–7 mm longis 3.3–5 mm latis 2.5–3.5 mm crassis anguste elliptico-obovoideis



FIG. 277A. *Pandanus bracteosus* St. John, staminate plant (Moitley 1,247). *a*, Inflorescence, lateral view, $\times 1$; *b*, fascicle of stamens, lateral view, $\times 10$.

subcompressis parte $\frac{1}{3}$ supera libera, pileo sub-hemispherico 2–2.5 mm alto laevi lucido, stigmatē 1.5–2 mm lato vadose reniformi prostrato brunneo papilloso, sinibus proximalibus latis et conspicuis et ex sinu stigmatē projectentibus basi fructu per 1.7–2 mm carnosā, semine incognito, parte supero (mesocarpio apicali) 5–5.5 mm longo in lateribus cum fibrīs fortissimis longitudinalibus arcuatis.

DIAGNOSIS OF HOLOTYPE: Roots unknown; stem "2.5–3.3 m tall"; leaf 1.05 m long, 4 cm wide $\frac{2}{3}$ way out, 2.8 cm wide near the base, coriaceous, green above, paler green below, V-sulcate, 2-pleated, at midsection with 40 parallel secondary veins in each half; tertiary cross veins evident below throughout, mostly oblique, forming rhombic meshes shorter than broad; blade almost ligulate, widest at $\frac{1}{3}$ from apex and scarcely tapering before the contraction to the acute tip, at the point 10 cm down 36 mm wide, the base unarmed, pale; beginning at 2.5 cm up the margins with prickles 1–2 mm long, 1–4 mm apart, the first few subulate serrae, the subsequent ones subsigmoid thick subulate, compressed, ascending, pale with brown tips; the midrib below beginning at 11 cm up with prickles 3–3.5 mm long, 13–24 mm apart, arcuate stout subulate, strongly reflexed, stramineous with dark brown tips; at midsection the margins with prickles 2.2–3 mm long, 7–11 mm apart, straight or subarcuate stout subulate, strongly ascending, pale with brown tips; throughout the central third the midrib unarmed; near the apex the margins and midrib below with arcuate subulate prickles 0.6–1.5 mm long, 0.5–2.5 mm apart, strongly ascending, pale with dark brown tips; toward apex the pleats above with prickles 0.5–1.3 mm long, 2–11 mm apart, arcuate subulate, rigid, strongly ascending, pale; pistillate inflorescence 7 cm long, many-bracted, cernuous, and the 3 syncarps mostly concealed; peduncle 3 cm long, completely concealed by the crowded green bracts; lowest peduncular bract 3 cm long, 1.8 cm wide, lanceolate, only the upper margins serrate; uppermost peduncular bract 6.5 cm long, 2 cm wide, oblong lanceolate, the margins subulate-serrate nearly throughout as is the midrib below in outer half; bracts subtending the syncarps 2.5 cm long, 2.3 cm wide, elliptic, concave; apical syncarp 2 cm in diameter, globose; lateral syncarps 1.3 cm in diameter,

similar; drupes appearing nearly mature, but as they lack endocarp and seed they are immature; drupes unequal, those near the apex being nearly twice as wide and thick as the median and lower lateral ones; drupes (immature) 6.5–7 mm long, 3.3–5 mm wide, 2.5–3.5 mm thick, narrowly elliptic-obovoid, slightly compressed, upper $\frac{1}{3}$ free; pileus almost hemispheric, 2–2.5 mm high, smooth, shining; stigma 1.5–2 mm wide, widely shallow reniform, flush, chocolate brown, papillose; proximal sinus wide and prominent, slightly exceeding the cleft of the stigma; fruit body with lower 1.7–2 mm fleshy; endocarp in lower $\frac{1}{3}$, becoming bony, with an apical bristle; seed not seen; upper part 5–5.5 mm long (apparently the upper mesocarp) bounded by numerous heavy, arching, longitudinal fibers.

Staminate Plant (*Motley 1,247*): Habit and herbage unknown; staminate inflorescence an 8 cm rhachis with thick, rigid bracts subtending the spikes; lowest bract 10.5 cm long, 4 cm wide, lanceolate, navicular, the margins and midrib below toward the apex minutely serrulate; uppermost bract 15 mm long; spikes 1.5–3 cm long, 10 cm in diameter, cylindrical, dense; stamens clustered together, mostly in pairs; column 0.8 mm long, bearing at its tip the free filament tips, these 0.4–0.5 mm long; anthers 7 mm long, linear, bearing at the tip a 0.5 mm subulate prolongation of the connective.

HOLOTYPE: [Indonesian] Borneo, Bangarmassing [= Bandjarmassin], 1857–8, *J. Motley* (CGE). Isotype (K)!

SPECIMENS EXAMINED: [Indonesian] Borneo: Bangarmassing, *J. Motley 1,247* (K).

DISCUSSION: *P. bracteosus* is a member of the section *Microstigma*, as is its closest relative, *P. paloensis* Elmer, of Mindanao, Philippines, a species with bracts of the fruiting spike caducous; stigma 0.5–0.8 mm wide, transversely elliptic; leaves 24–28 mm wide, at midsection with 24 parallel secondary veins in each half; at midsection the margins with prickles 0.8–1.2 mm long, 3–10 mm apart, arcuate subulate, compressed, ascending. *P. bracteosus* has the bracts of the peduncle and fruiting rhachis persistent, almost concealing the syncarps; stigmas 1.5–2 mm wide, shallow reniform;

leaves 40 mm wide, at midsection with 40 parallel secondary veins in each half, and with the margins with prickles 2.2–3 mm long, 7–11 mm apart, straight or subarcuate stout subulate, strongly ascending.

P. bracteosus is placed in the section *Microstigma*, although the staminate flowers are unusual. This section has the several stamens united in clumps and with the free filament tips umbellate at the apex of the united filament lower parts, the column, which is typically longer than the anthers and their free filament tips. In *P. bracteosus* the stamens of a clump are few, mostly two, and the column is only $\frac{1}{4}$ the length of the anthers and their free filament tips. One other known species, *P. polycephalus* Lam., also has the column much shorter than the free parts. In both of these species the free parts are truly umbellate on the apex of the column. Despite its shortness the grouping and connation of the stamens seems to follow the same basic plan. Consequently *P. bracteosus* seems to be correctly placed in the section *Microstigma*.

The new epithet is the Latin adjective *bracteosus*, with bracts, and is given with reference to the persistent bracts hiding the syncarps.

***Pandanus sulcatus* sp. nov. (sect. *Rykia*)**

Fig. 278

DIAGNOSIS HOLOTYPE: Licet frutex, ramulis in apice 12 mm diametro, foliis 16 mm latis coriaceis profunde U-sulcatis 2-plicatis licet ligulata in puncto 8–11.5 cm ex basi cum 20–21 nervis parallelis secundariis in quoque dimidio, nervis tertiis reticulatis breviter oblongis formantibus, basi inermi pallida, ex 3–4 cm marginibus cum aculeis 0.8–1.5 mm longis 3–7 mm separatis subulati-serrulatis ad arcuato-subulatis crassis compressis adscendentibus stramineis, midnervo proximo infra inermi, sectione mediali non visi, in apice subulato marginibus et midnervo infra cum aculeis 0.5–0.8 mm longis 1–2 mm separatis arcuati-subulatis adscendentibus stramineis, infructescentia spicata cum 3 syncarpiis, pedunculo 9.5 cm longo 7 mm diametro 3-laterato subclavato, syncarpio apicali 6 cm longo 3.8 cm diametro cylindrico obtuso cum 90 drupis, syncarpiis lateralibus 4–4.3 cm longis 3.5 cm diametro ellipsoideo cum 80 drupis, eis 19–21 mm longis 7–12 mm latis 6–11 mm crassis ex basi ad apicem drupis sensim majoribus late cuneatis 5–6-angulosis in apice latissimo, apice obtuso videtur sed vere vadose retuso parte $\frac{1}{6}$ – $\frac{1}{4}$ supera libera laevi lucido, pileo 2–3 mm alto, stylo 3 mm longo $\frac{1}{3}$ bifido osseoso, stigmatibus 1.5 mm longo lanceolato bifido brunneo papilloso, endocarpio centrali obpyramidalis osseoso obscure brunneo apice concavo lateribus lateralibus 1–1.5 mm

crassis intra lucido sublaevi sed in spiris striatis, semine 4 mm longo anguste obconico, mesocarpio apicali valde oblato suborbiculari cavernoso cum membranibus latis brunneis paucis, mesocarpio basali fibroso et carnoso.

DIAGNOSIS OF HOLOTYPE: Apparently a shrub; branches 12 mm in diameter at apex; leaves of unknown length, all cut off at 8–11.5 cm from the base, 16 mm wide, thick, coriaceous, deeply U-sulcate, 2-pleated, blade apparently ligulate, at 8–11.5 cm from the base with 20–21 parallel secondary veins in each half, the tertiary veins seen near the base, especially above, forming short oblong meshes, the base unarmed, pale, beginning at 3–4 cm up the margins with prickles 0.8–1.5 mm long, 3–7 mm apart, subulate-serrulate to arcuate stout subulate, compressed, ascending stramineous; the nearby midrib below unarmed; on the subulate apex the margins and midrib below with prickles 0.5–0.8 mm long, 1–2 mm apart, arcuate subulate, ascending, stramineous; infructescence a spike with 3 syncarps; peduncle 9.5 cm long, 7 mm in diameter, 3-sided, slightly clavate; apical syncarp 6 cm long, 3.8 cm in diameter, cylindrical, the ends obtuse, bearing 90 drupes; the lateral syncarps 4–4.3 cm long, 3.5 cm in diameter, ellipsoid, bearing 80 drupes; drupes 19–21 mm long, 7–12 mm wide, 6–11 mm thick, progressively larger from base to apex of syncarp, broad cuneate, 5–6-angled, the apex the broadest part, appearing obtuse but actually shallow retuse, upper $\frac{1}{6}$ – $\frac{1}{4}$ free, the surface smooth, shining; pileus 2–3 mm high; style 3 mm long, bifid $\frac{1}{3}$ way, bony; stigma 1.5 mm long, lanceolate, bifid, brown, papillose; endocarp central, obpyramidal, bony, dark brown, the apex concave, the lateral walls 1–1.5 mm thick, within shining, smoothish, but somewhat peripherally striate; seed 4 mm long, narrowly obconic; apical mesocarp strongly oblate suborbicular, a cavern with a few broad brownish membranes; basal mesocarp fibrous and fleshy.

EXPANDED DESCRIPTION: Stout shrub 6 m tall; branchlets 1.2–2.2 cm in diameter, white, ringed by dark brown leaf scars; prop roots 1.3 m long; leaves 98 (+ 50–70 ?) cm long, 28 mm wide near the middle, 16–24 mm wide near the base, near the middle with 20–26 parallel secondary veins in each half and there the

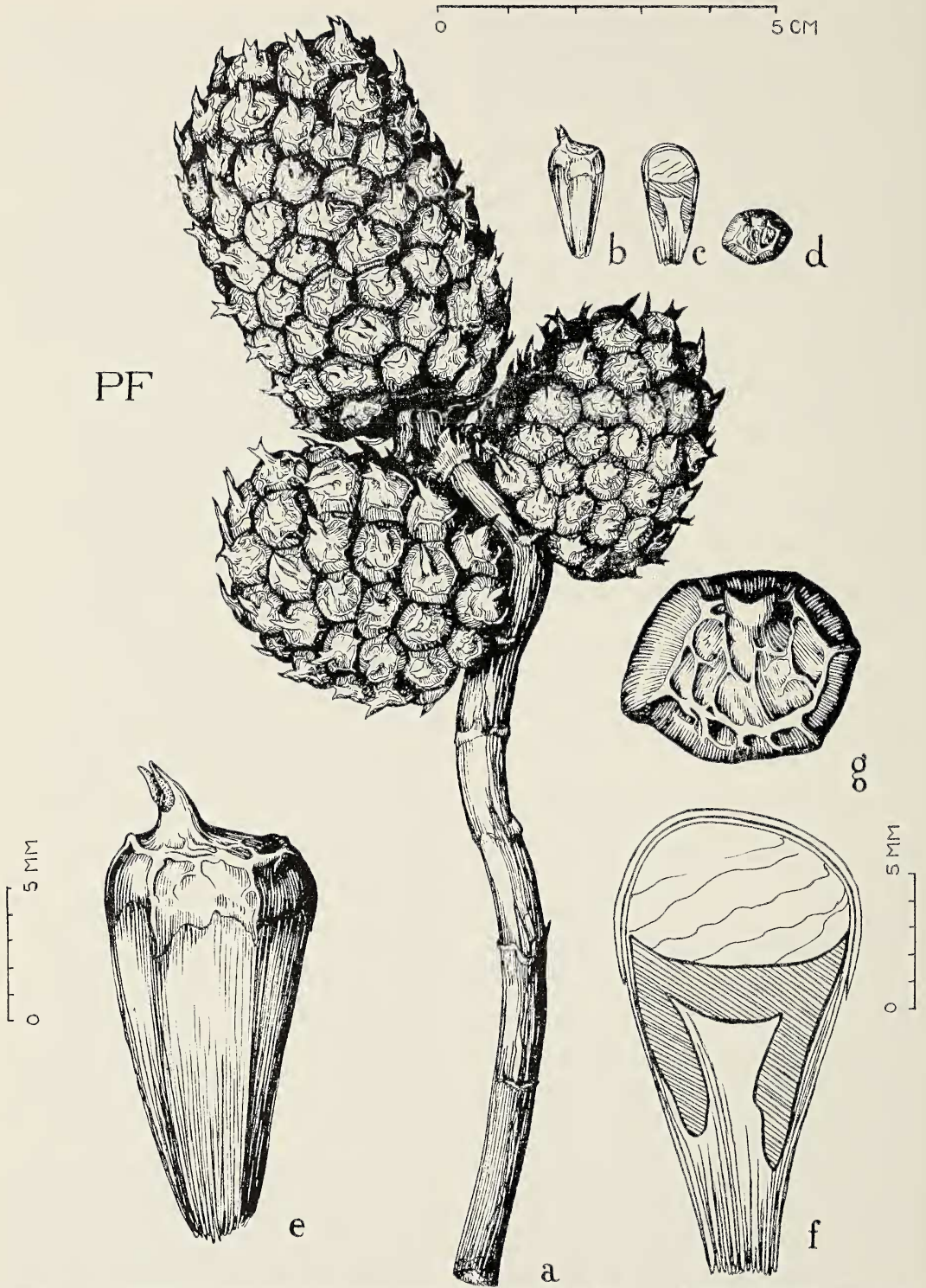


FIG. 278. *Pandanus sulcatus* St. John, from holotype. *a*, Fruiting spike, $\times 1$; *b*, drupe, lateral view, $\times 1$; *c*, drupe, longitudinal median section, $\times 1$; *d*, drupe, apical view, $\times 1$; *e*, drupe, lateral view, $\times 4$; *f*, drupe, longitudinal median section, $\times 4$; *g*, drupe, apical view, $\times 4$.

margins with prickles 0.4–0.8 mm long, 4–10 mm apart, subulate with a long lower side, compressed, almost appressed ascending, stramineous with red tips, alternately large and small, the nearby midrib unarmed; infructescence a spike of 3–4 syncarps; peduncle 9–14 cm long; apical syncarp the largest, 6–6.5 cm long, 3.8–5 cm in diameter, the lateral syncarps 4–5.5 cm long, 3.5–5 cm in diameter; drupes 19–26 mm long; pileus 2–4 mm high; style erect, 3–4 mm long.

HOLOTYPE: Borneo, *James Motley 38* (K MUS.).

SPECIMENS EXAMINED: Sarawak, Ulu Begrih, Bawan, Balingian, ridge top, leached yellow sandy soil, mixed Dipterocarp forest, low altitude, 20–10–63, *Paul Chai S.19,455* (SAR).

Indonesian Borneo: West Kutei, Mt. Palimasan, on Belajan R., near Tabang, foothills along Meu R., 100 m alt., 6 Sept. 1956, *A. Kostermans 12,726* (L).

DISCUSSION: *P. sulcatus* is a member of the section *Rykia*, as is its closest relative, *P. angustus* St. John, of Hayoep, southeast Borneo, a species with the drupes 15–19.5 mm long, 6.5–8 mm wide, the upper $\frac{1}{3}$ free; pileus 3–4.5 mm high; endocarp in lower $\frac{2}{5}$; seed 6 mm long; leaf margins beginning at 5–6 cm from the base with serrae 1–1.6 mm long, 5–8 mm apart, yellowish. *P. sulcatus* has the drupes 19–26 mm long, 7–12 mm wide, the upper $\frac{1}{6}$ – $\frac{1}{7}$ free; pileus 2–4 mm high; endocarp central; seed 4 mm long; leaf margins beginning 3–4 cm from the base with prickles 0.8–1.5 mm long, 3–7 mm apart, subulate-serrulations to arcuate stout subulate prickles, ascending, stramineous.

The collector, James Motley, was an engineer who developed a coal mine near Kalangan, but eventually was murdered by the natives. He collected a good many plants, and already has one *Pandanus* species named for him.

The new epithet is the Latin adjective *sulcatus*, furrowed, and is given with reference to the deep central furrow of the leaves.